Submarine A-RCI Program
and the
Evolution of Life Cycle Support

A Presentation to the

NDIA
Systems Engineering and Supportability Conference

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Purpose

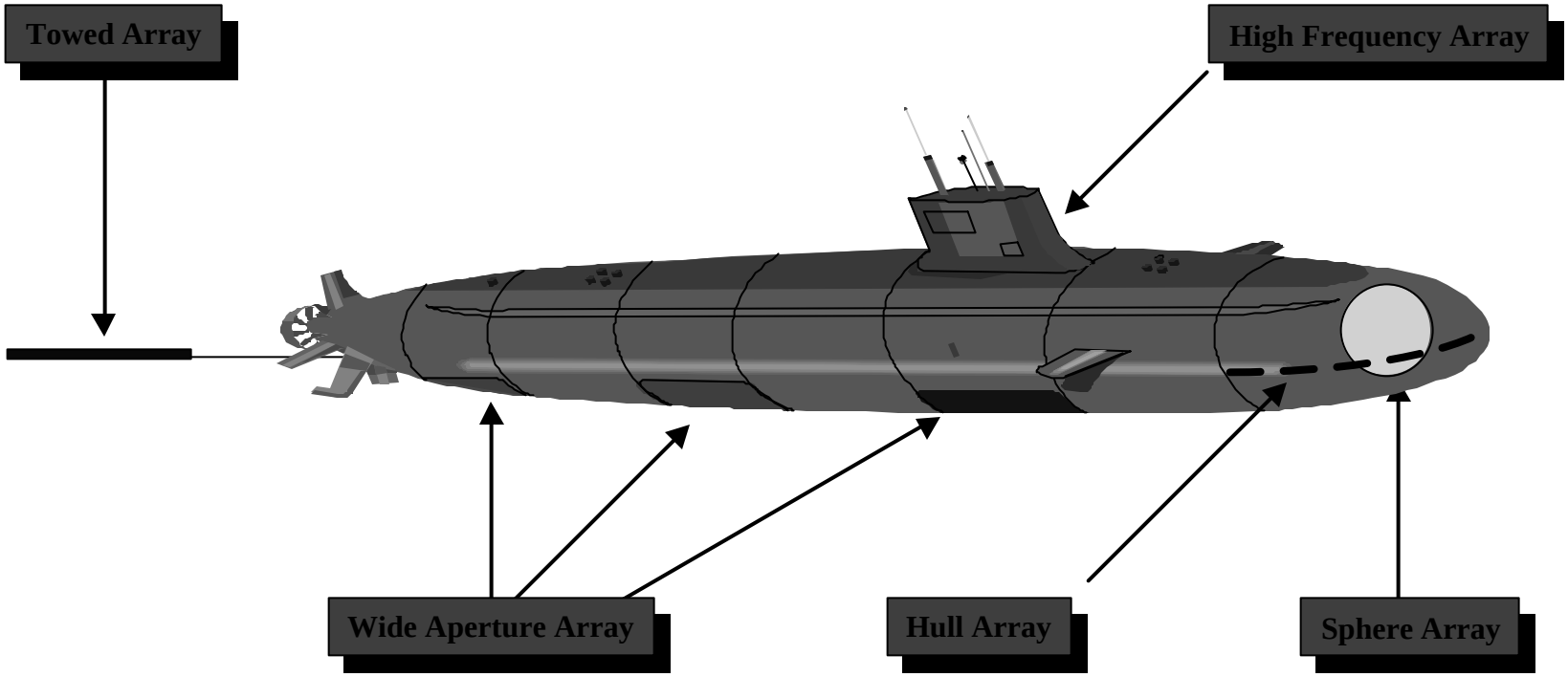
- Provide overview of A-RCI program
- Discuss hardware Tech Refresh through production
- Discuss training program innovations
- Review innovations in Logistics products/processes implemented to support A-RCI
- Review support cost avoidances achieved to date through the implementation of these revised products/processes
- Review success of A-RCI program

The Dilemma

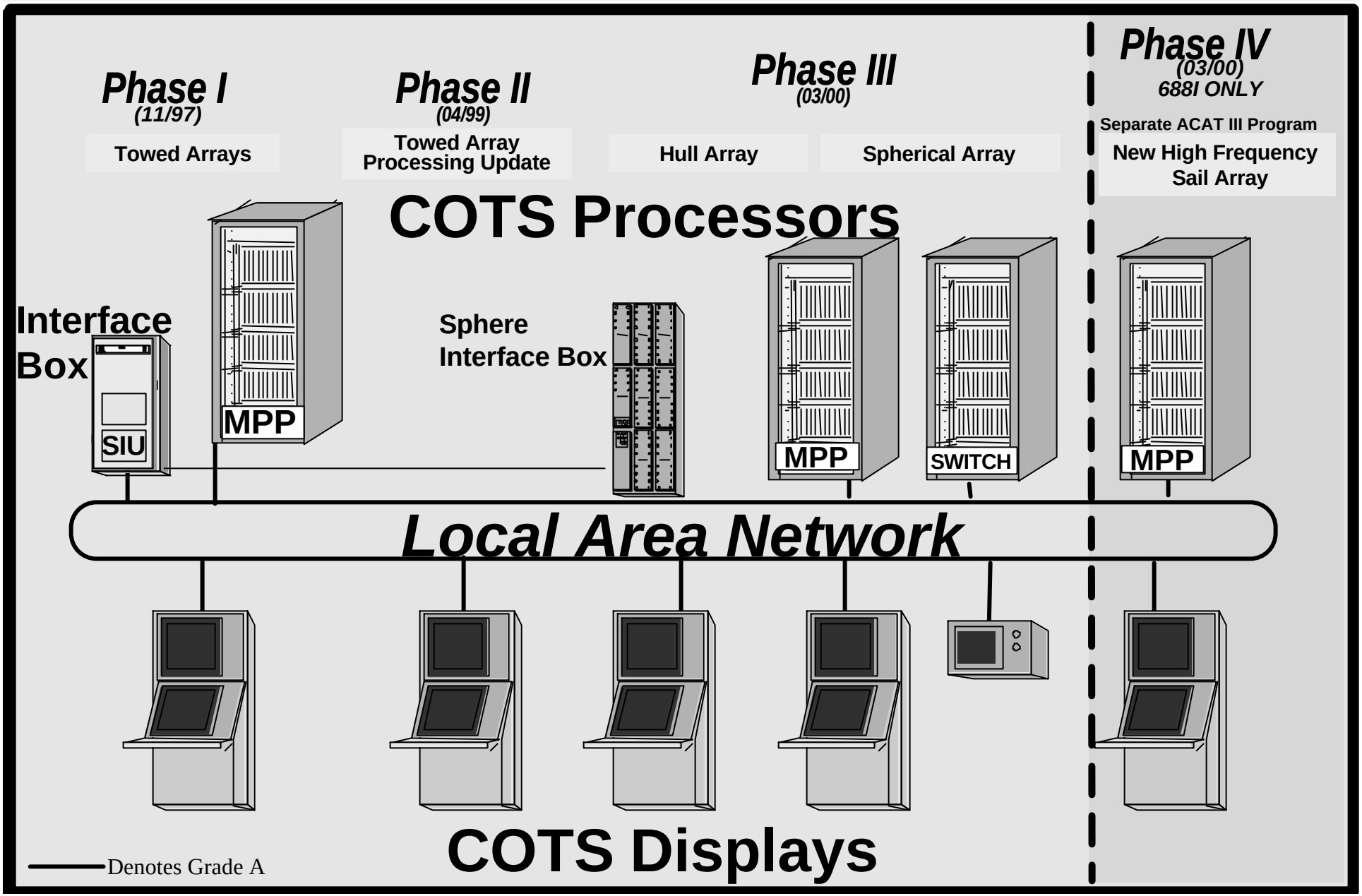
- Recent “acoustic superiority” shortfalls
  - Major acoustic capability improvements were needed and fast
- Existing acoustic planned improvements were too little, too late, and too limited
  - Legacy system processing capacity exhausted
  - Upgrading legacy systems was too expensive
- Inability to expedite advanced development products to the fleet
  - Transition time to fleet introduction took too long
    - Build-test-Build
    - Flexible infusion of technology

We had to re-think the details of submarine acoustic programs of record

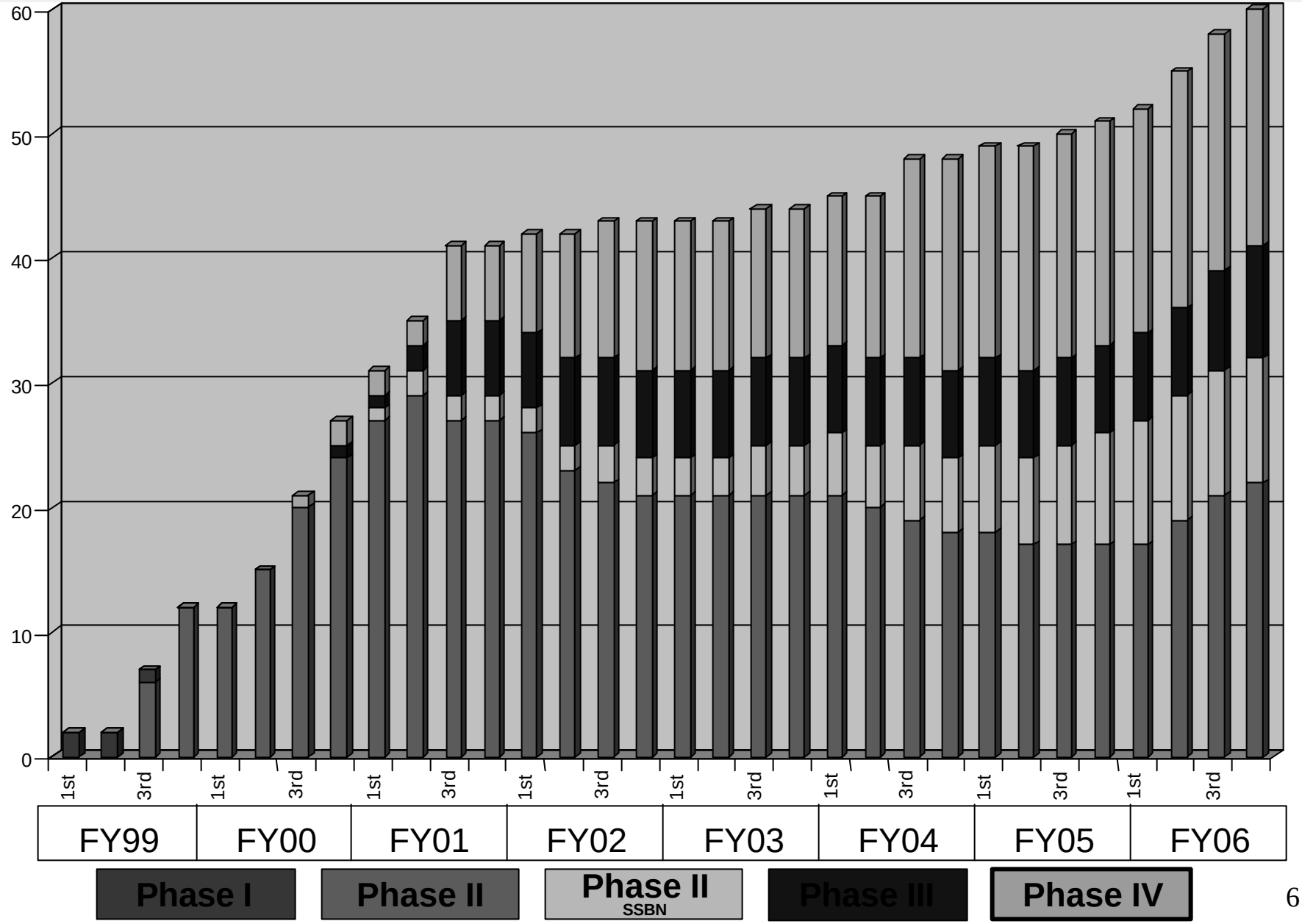
Submarine Sonar Sensors



A-RCI = AN/BQQ-10 IMPLEMENTATION + APB's



A-RCI Installation Profile (POM 02)

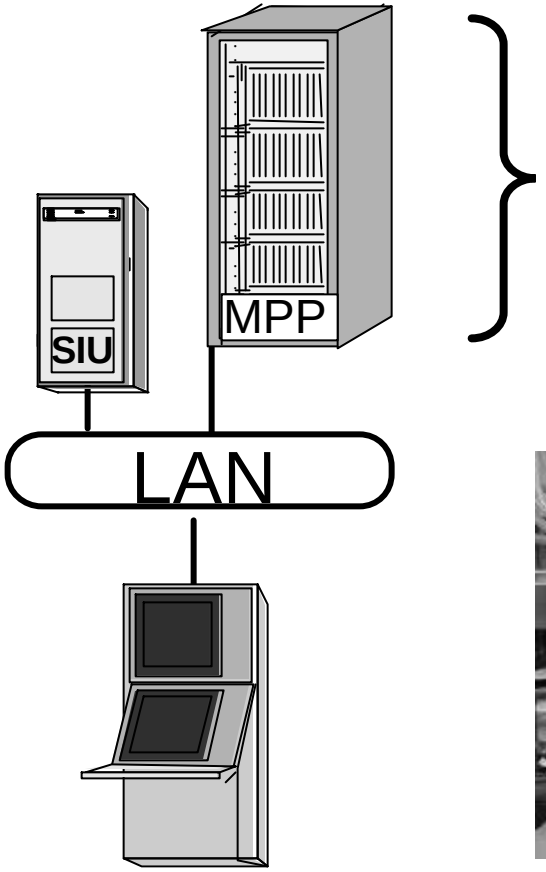


Tech Refresh Through Production

Initial Technology -- FY97

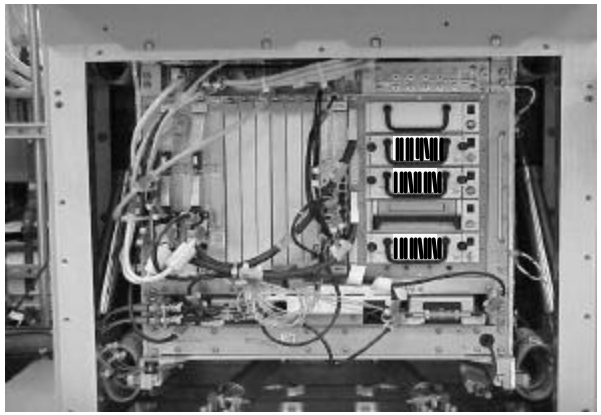
Phase I
(11/97)

Towed Arrays



- Quad i860 cards
- MBIF/CBF (SHARC)
- Unique Design Signal Conditioner

Deployed on Two Submarines:
USS Louisville & USS Augusta

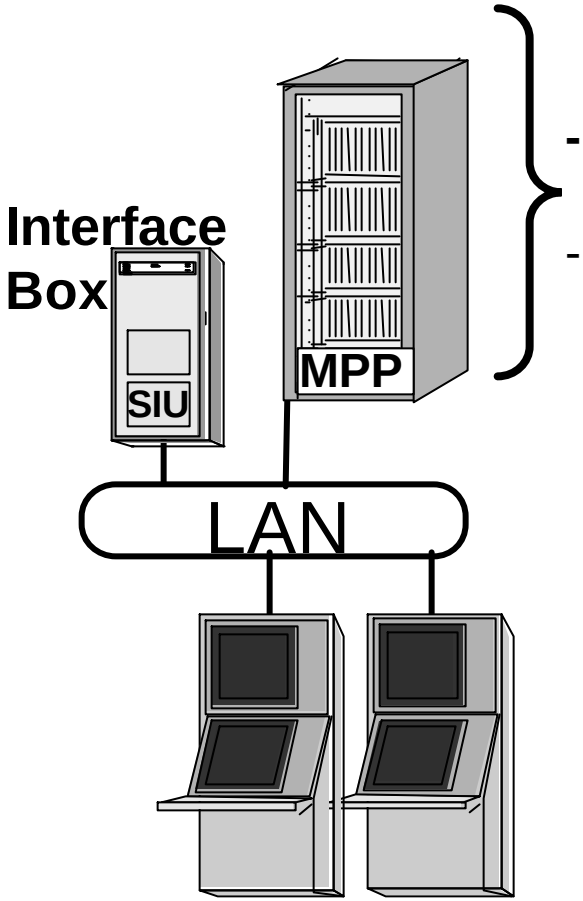


CDWS

- HP744 Processors
- Processor 128 MB & 256 MB Processors

Tech Refresh Accomplished Through A-RCI Production

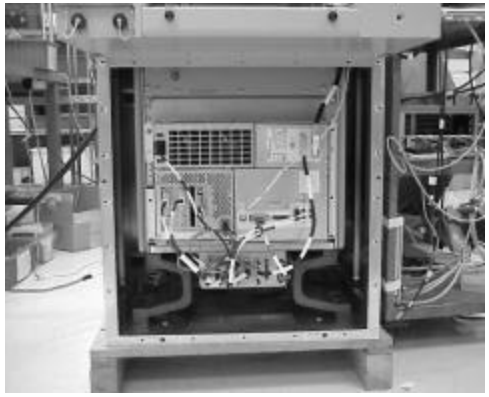
Phase II
(04/99)



98 Buy

- Quad Power PC 200Mhz cards
- COTS Signal Conditioner

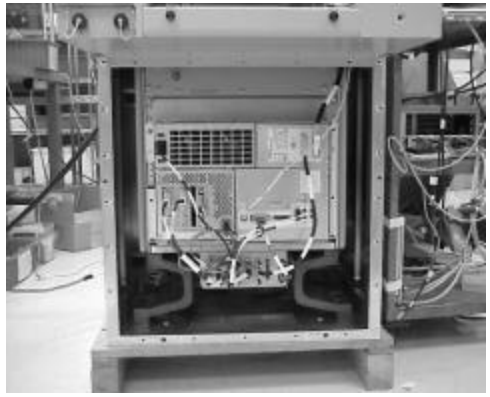
ECDWS
HP J2240
Processor



99 Buy

- Quad Power PC 300Mhz cards
- COTS Signal Conditioner

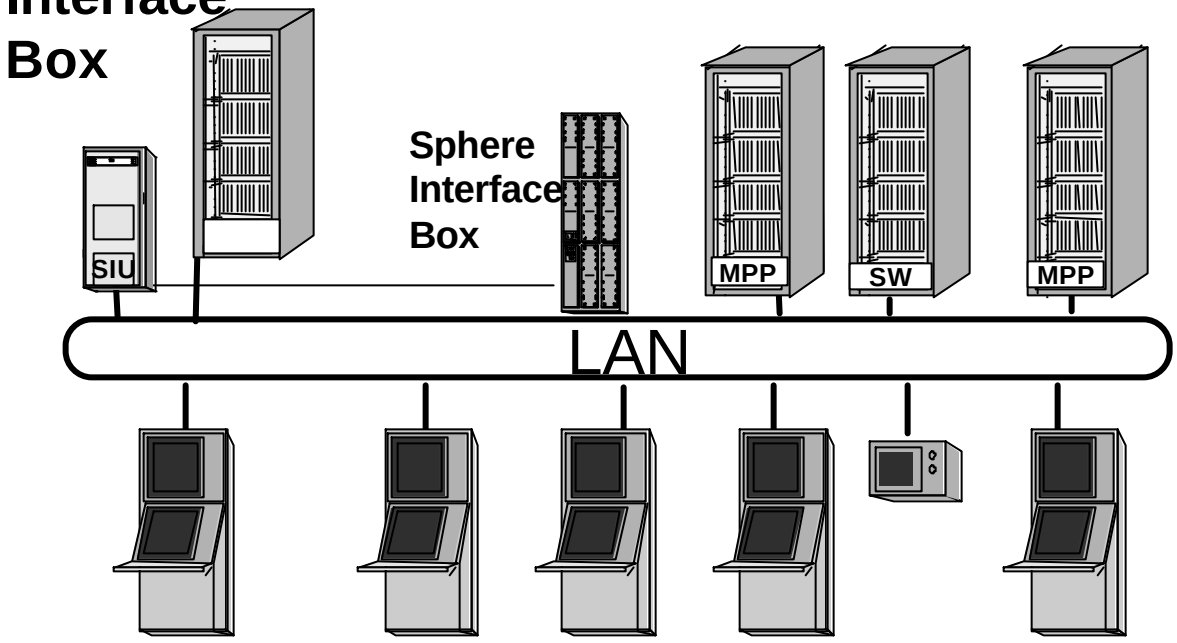
ECDWS
HP J5000
Processor

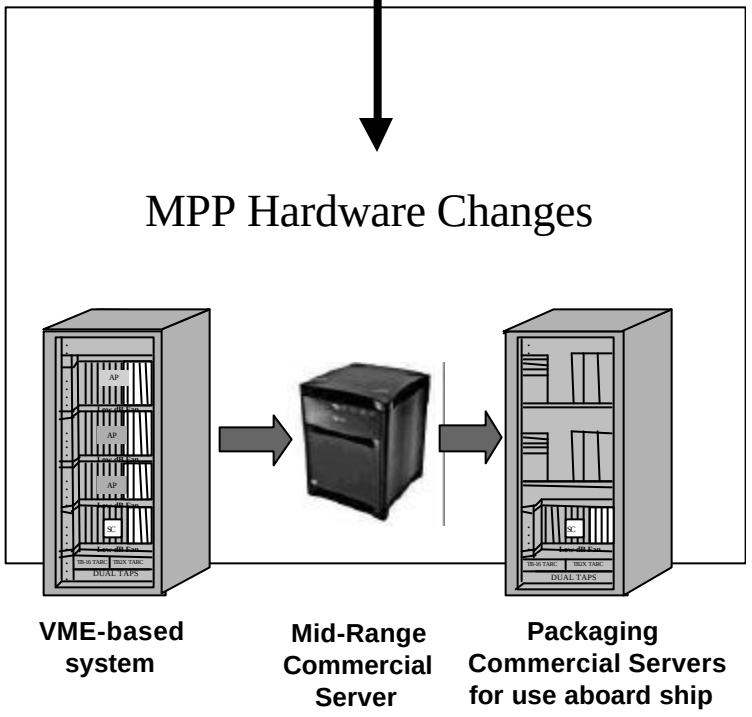


FY00 Tech Refresh

2000 Buy

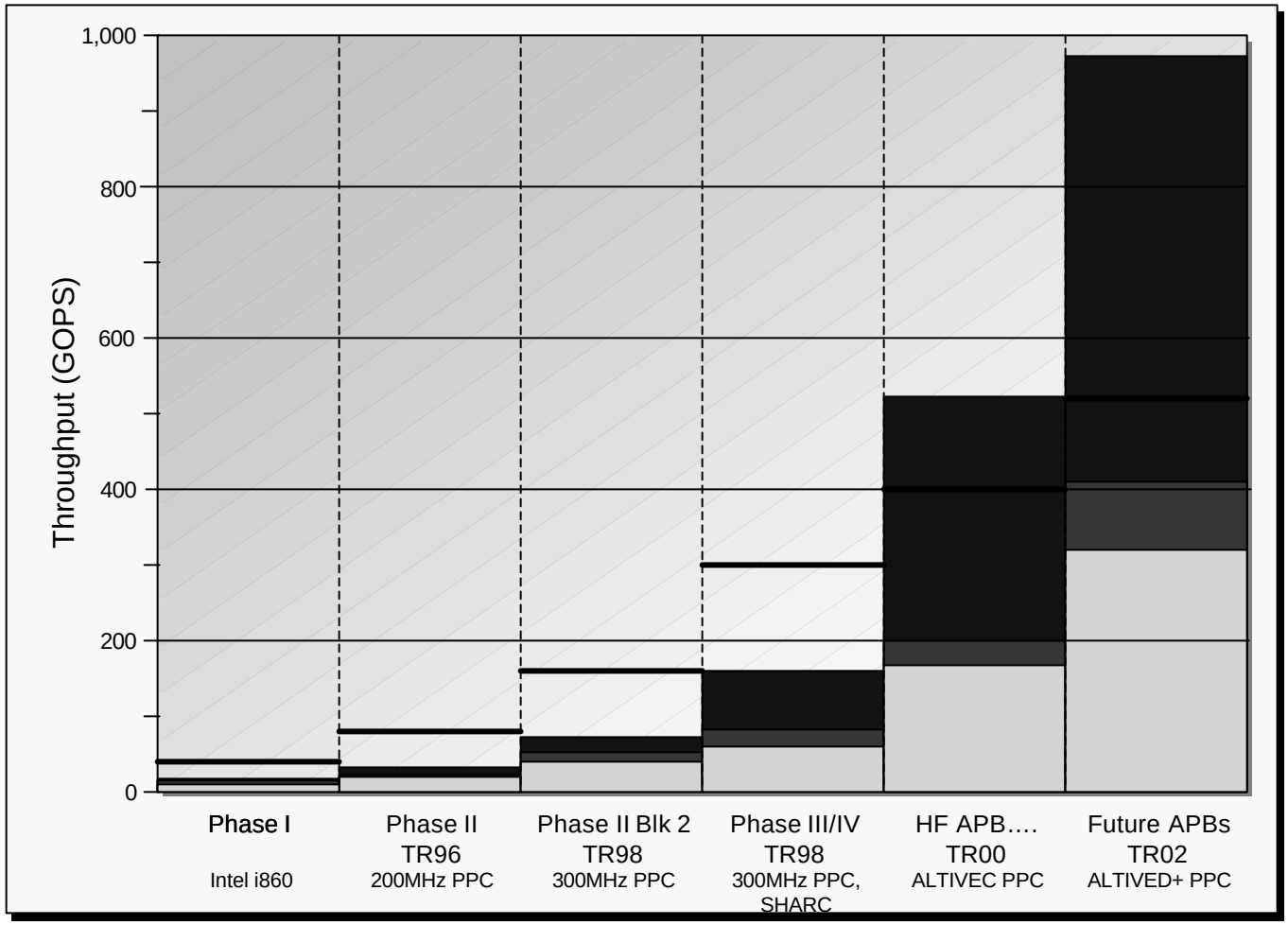
- Quad Power PC 375Mhz cards
- Commercial Symmetric Multi-Processor (SMP) Servers
- COTS Signal Conditioner





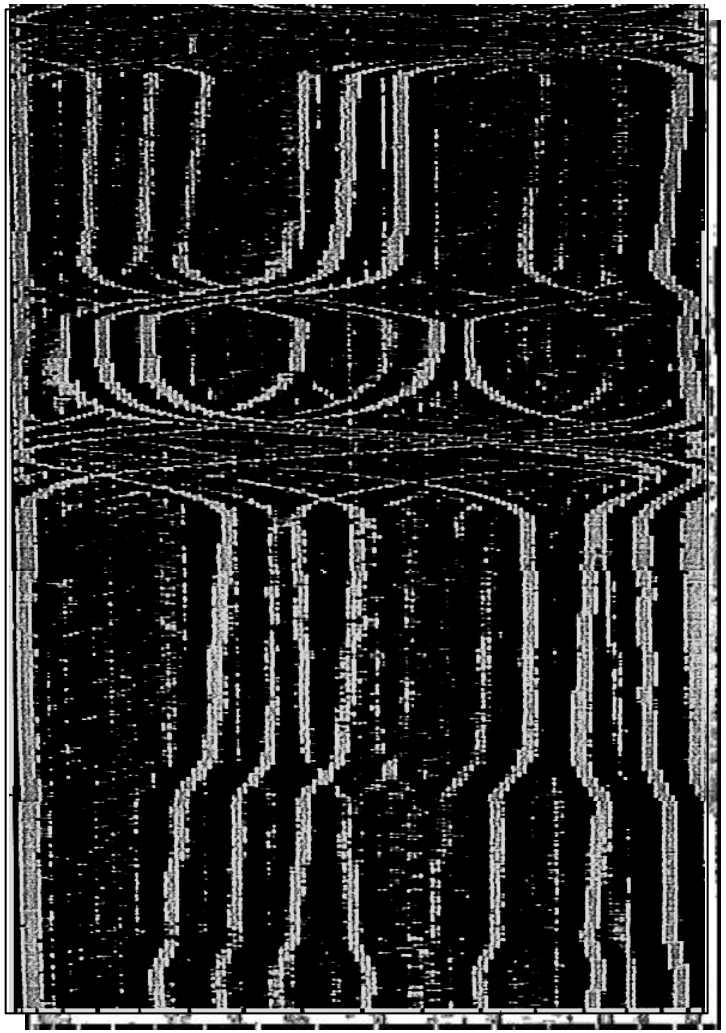
ARCI Processing Projection

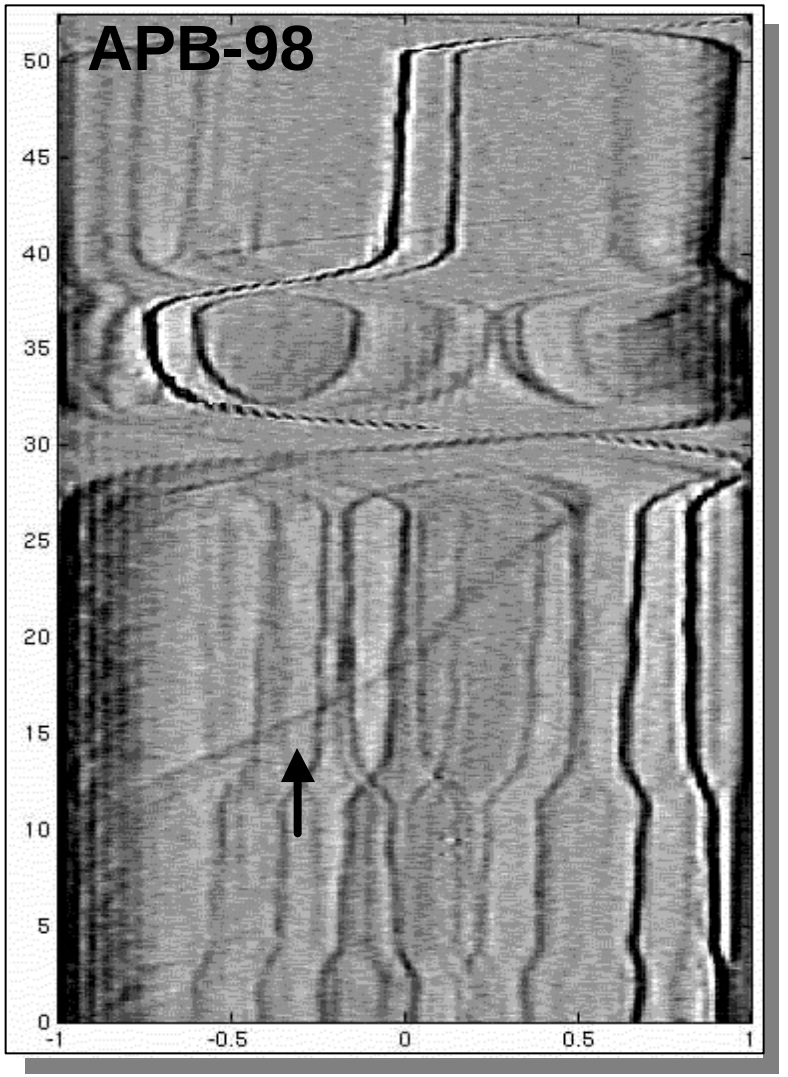
With Technology Insertion



Utilized Processing Capacity
Installed Capacity
Fully Populated Capacity (Max drawers & cabinets)
Latent Demand Estimate
TRxx Technology Model Year

GAINS IN APB-98





- **Same Sensor (TB-23)**
- **Increased Initial Detection Range and Hold Time**
  - **Use of Full VLF Aperture**
  - **Split Aperture Broadband Correlation**

Innovations in Training

Training Implementation
-- Background

- A-RCI is delivering Sonar Updates ~ Annually
  - Evolving Displays and Features
  - Evolving Processing
- A-RCI Improvements are Lost on Untrained Operators
- Traditional Pipeline Training does support current Fleet demographics of Operator skill levels
- COTS Technology allows Delivery of the Training with the Tactical System

Revised Training Approach

- Develop Embedded Training for APB Sea Tests (ASTO SBIR)
  - Basic Operator Training (Displays and Controls)
  - Signal Recognition Training (Threat Signature Analysis)
- The Training is Embedded in A-RCI Tactical Software
  - Run on the installed A-RCI systems
  - Uses the A-RCI tactical display and control (OMI) software
    - Training is naturally upgraded with the tactical system
- Capable of processing real ocean data (actual threat signatures)

Other Training Initiatives

- APB/A-RCI Installation Trainer
  - Four Systems delivered to the Fleet (Norfolk, NL, PH, San Diego)
  - Targeted Acoustic Analysis Training – Sea Data Playback
    - Post Install Periodic review
    - Pre-Mission Intel Updates
- Sonar Employment Trainer (SET)
  - Supporting NSWC to provide Towed Array Employment Training
  - Scenario Driven Training - Element level data for A-RCI Processing
  - Integrate with A-RCI embedded training and IMAT

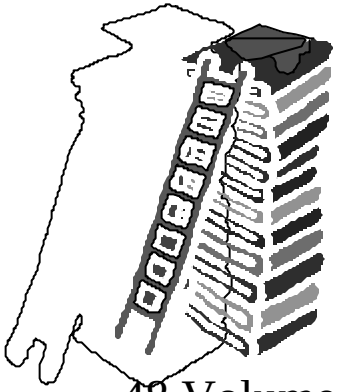
Evolution of A-RCI Logistics Support

Changes to the Logistics Support Model

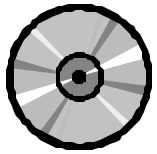
	Legacy Systems	A-RCI/IDP	Impact to Life Cycle Cost
Software Maintenance	Limited partitioning of code	Middleware buffers	↓↓↓
Maintenance	Replacement parts not tested prior to use	Fewer components; hot-box testing of replacement parts	↓↓
Supply	Inventory lay-in; individual transaction accounting	Just-in-Time / Direct Vendor Delivery	↓↓
Training	Unique shore-based installations	Greater use of embedded/computer-based training	↓↓
Facilities	Dedicated facilities for life cycle support	Convert development EDMs to appropriate configuration on ad-hoc basis	↓↓
Documentation	Unique data bases	Integrated data	↓

New Processes More Readily Accommodate System Change

Changes to Logistics Support Products



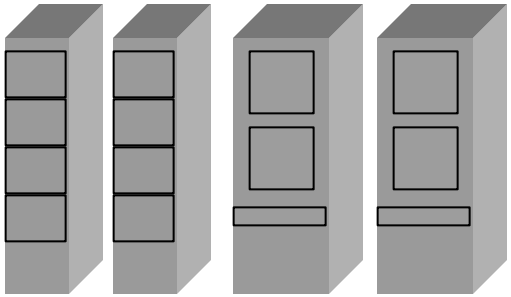
48 Volume
Paper Tech Manual



1 CD IETM

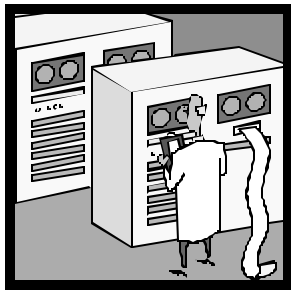
$600 Million
BSY-1 Inventory

Just-In-Time
Support

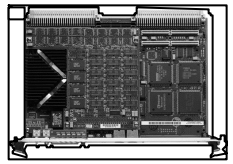


Tactical System
Maintenance Trainer

ICW



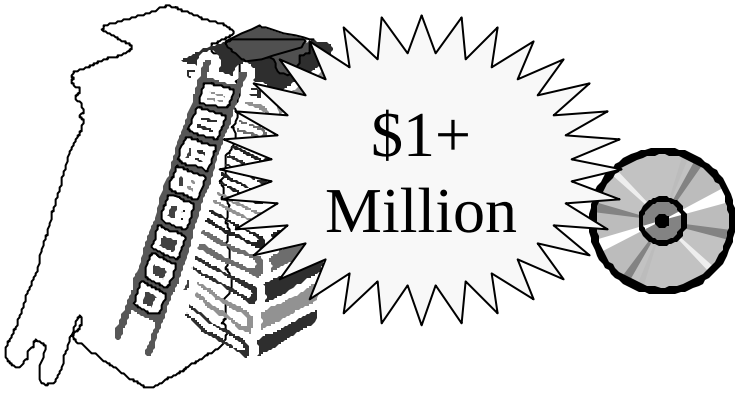
Complex
Component Change



A-RCI Component
Integration

New Products Have Smaller Logistics "Tail"

Realized Cost Avoidance



IETM

Direct Vendor Delivery

Interactive Multimedia Instruction

Outfitting Spares Reduction

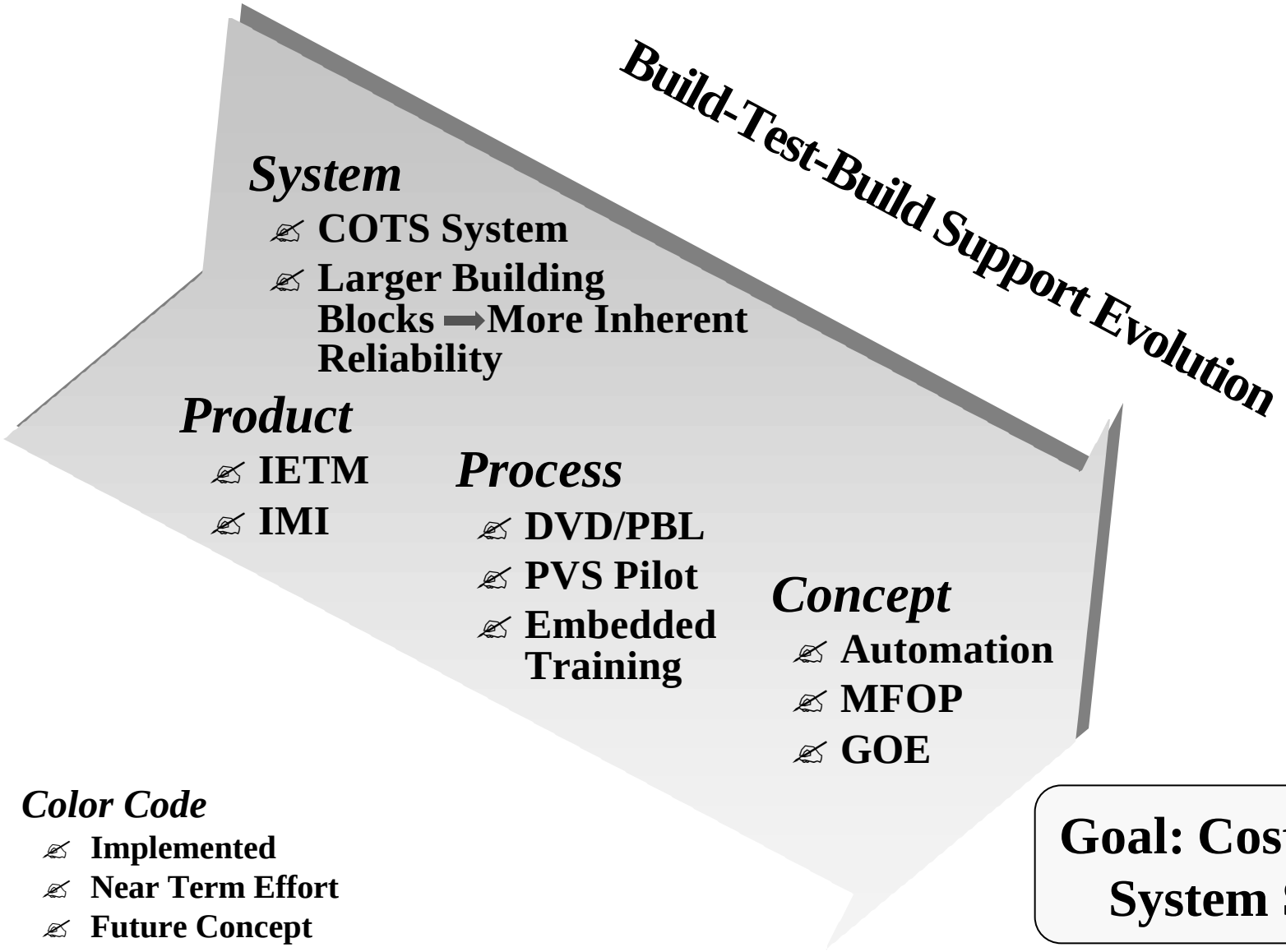
Logistics Program Axioms

- Changes to shipboard procedures should be minimized
- Supply Support
  - LRU selection shall consider availability of commercial warranty
  - Shore-based stock inventories should be eliminated where possible and minimized in all other cases
  - End of life or life of type buys of commercial items are an unacceptable solution to continued production or support
- Maintenance training
  - Maintenance training should concentrate on theory training with unique aspects of system design covered in the IETM.
  - Maintenance training design should not depend on specific system configuration and should support “training to technology”.
- Logistics documentation format shall be determined on the basis of use of popular commercial software, rapidity of update, and intuitive presentation

Design Corollaries

- Tech refreshes should evolve the system toward progressively higher architectural building blocks or LRUs
- The best commercial product solution is that which requires the least amount of integration time
- Intuitive displays are desirable alternatives to training

A-RCI Life Cycle Support Evolution



Color Code

- Implemented
- Near Term Effort
- Future Concept

Goal: Cost-Effective System Support

A-RCI Logistics Program Evolution Goals

- Evolve A-RCI life-cycle support toward a contractor logistics support (e.g. PVS) process
  - DVD/PBL in place
    - Demonstrated to be as responsive as standard Navy supply support
    - Demonstrated to save money through reduction of required shore inventory
  - Evaluating expansion of contractor logistics support to maintenance and training
    - PVS concept development TI (funded by NAVSEA 04) in place with Lockheed Martin, Manassas
    - Result of development TI will define feasibility of conducting an A-RCI PVS pilot support program
- Improve system maintainability
  - Larger/integrated LRUs (Compaq Server with TI 2000)
  - Maintenance Free Operating Period (MFOP)

A-RCI Successes

A-RCI Program Recognition

- Vice President’s Hammer Award -- Integrated Development Program
- Vice President’s Hammer Award -- A-RCI
- NAVSEA Logistics Team of the Year -- 1999
- Defense Certificate of Recognition for Acquisition Innovation
- Defense Acquisition Executive Certificate of Achievement
- NAVSEA Commander’s Award for Excellence
- Navy (ASN-RDA) Certificate of Excellence